

Review Article

Design and Analysis of Disc Brake Rotor using Catia and ANSYS Software - A Review

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ABSTRACT

The compact disk are a tool that slows down or stops the wheel rotation. Friction causes the disc and the attached tire to slow down or stop. Brakes turn heat into heat, but if the brakes are too hot, they will stop working because they cannot absorb enough heat. This state of failure is known as brake fade. Disk brakes are exposed to extreme heat stress during normal braking as well as normal heat pressures during heavy braking. The actual disc brake has no holes; the design is adjusted by providing holes in the disk brake to release more heat. In this project work an attempt was made to model and break the first disc brake model and assemble using catia V5R20 and direct and modal analysis was performed with ANSYS 14.0 software using four different materials such as mild steel, Aluminum, Castiron and composite material (e-glass).

KEYWORDS

Structure and Transient analysis, ANSYS, FEA, Ventilated disc brake

1. INTRODUCTION

The disc brakes they are two solid species that are packed and airtight. Disc brake is a tool to reduce or stop wheel rotation. A brake disc (or rotor) is usually made of sharp metal or ceramic composites (including carbon, Kevlar and silica), attached to a wheel and / or axle. To stop the wheel, brake material (brake caliper device) is forced into a machine, pump, ventilator or magnetic field on both sides of the disk. These brakes offer better braking performance than similar drumbrakes, which include resistance to "brake fade" caused by excessive heat on parts of the brakes, and the ability to recover quickly from immersion (water brakes do not work properly). Discs are now a common practice in many passenger cars, although many (especially lightweight cars) use drum brakes on the rear wheels to reduce costs and weight and make it easier to adjust the brakes. Since the front brakes make a great effort to brake, this would be a logical compromise.

Friction brakes work by generating collision forces as two or more areas collide with each other. The stopping force or capacity of the collision brake depends on the contact area and the coefficient of collision of the working surfaces and the starting pressure applied. Wear wear occurs in workplaces, and the durability of a given brake (or service life during repairs) depends on the type of collision material used in the replacement parts of the brake. When the drake disc is in a solid body the transfer rate is low. The time taken to cool the disk is short. If the brake disc is in a

solid body, the contact area between the Disc and the Pads is higher, so the efficiency of the brakes is high. We have introduced a variety of vanes pattern from disc to ventilated disc brake. Heat transfer rate rises. The time taken to cool the disk is high. It has been shown that the production of a large amount of heat in the disc area during brazing needs to be dissolved as efficiently and as quickly as possible.



Figure.1 Car Rotor disc

It is noteworthy that many materials have a binding mechanism that prevents overheating, which leads to the failure of the brakes due to a brake fade and judge position. Items such as car speed, brake type (Emergency braking or repetitive braking), rotor geometry and size, disc or pad materials (Cast iron, Aluminum metal matrix composite, ceramics etc.), the distribution of communication stress etc.

other potential features. variety to achieve satisfactory heat dissipation.

2.LITERATURE SURVEY

Pravin Mohan and Patel Sudheendra S [2017] Post-work activity thinks of a smart system of plate brake plate. The circular brakes provide superior braking, more precise design, light weight, and preferred protection from water traps over drum brakes. The point of this used structure was to increase the quality of the caliper, without increasing the caliper mass by a large amount and reducing the negative heat formation at high operating temperatures. Since titanium is difficult to make in a machine the formation of a single square of a common machine of machinery was not used in this work but rather an attempt was made to build a brake caliper with various parts and assembled together to form one unit. In addition the used titanium parts are made of non-stick plates to save money on future machine costs. As titanium has a high thickness care was taken while designing a new brake frame to keep the weight off. The current brake caliper is broken due to loading conditions with new recommended features. The results were intended for removal and concern associated with warm effects. The new caliper was measured by weight and unrelated load sand effects were considered for shift / reversal and concern for temperature impact. [1]

S. Arvin Rao, Muhamad Anwar Jusoh, Abd Rahim Abu Bakar*, (2017) Brakes screech has always been one of the most important challenges of Sound, Vibration and Strength (NSH) in the construction and development of the brake frame. For ten years it has plagued the automotive industry. Brake scientists have proposed a number of ways to reduce brake screech and counter-operation techniques in order to survive and reduce the ridicule that comes with the brake plate frame. In this paper, the effectiveness of obliged layer dampers (CLD) in reducing the noise of brake screech clamor has been evaluated. The CLD distinguishes the sound of brake screech by the shear damage of viscoelastic materials. Two brake test settings were geared using a brake test dynamometer using the CLD. Two different types of CLD were used, namely a three-dimensional bound damper and a mandatory four-layer damper. The Screech test was performed using a brake clamor test modification based on the SAE J2521 standard methodology. From the experiments, the four-layer CLD set is more effective than the three-layer CLD structure. The CLD made of nitrile butadiene elastic, silicone elastic and soft metal has already become the best water separator for a water range of 5 bar to 30 bar and a temperature of 50oC to 200oC with a significant reduction in shrinkage which is 11.3 dBA. In line with these lines, the CLD process eventually became a powerful way to reduce the noise of brake screech. [2].

Yugesh Anil Kharche and Prof. Dheeraj Verma [2014] The brake plate is a gadget that slows down or stops the wheel rotation. Braking is a process that changes over the stiffness of a motor vehicle into a mechanical force that must be disassembled as a heat exchanger. This paper shows the investigation of contact mass in the area of the plate interface using a 3-dimensional point model of a limited part of a real circular motor brake. Models of the limited (FE) part of the brake-circle are made using Pro-E and

replicate using ANSYS based on limited phase (FEM) strategy. It also checks the various sizes in displaying the brake plate frame and mimics the distribution of the contact weight with a different load. It incorporates the Finite Element Method methods in the automotive business for communication testing and warm inquiry. The effect of rakish speed and the relative mass of contact on the rise in temperature of the circular brake has been studied. Rubbing wear means a shortening of its lifespan. The more aging you are, the more conflicting things should be replaced. Diverse Brake cushion material has been tried as compared to the present. Eventually the correlation between the systematic results and the result obtained from Ansys became so strong, and all the attributes found in the investigation were not their own valid merits. So based on warmth and contact and pressure research the right things are suggested. [3]

K. M. Muniswamy et al. (2013), warm exchange upgrade on ventilated brake circle with cutting edge tendency point variety. The goal of the present examination is to research the potential warmth move improvements in ventilated brake plate by fluctuating the geometrical parameters of the cutting edges inside the stream entry. The thickness stays steady and just the length can be changed to fit the internal and external range. The computational model developed in GAMBIT. The models are comprehended utilizing ANSYS-FLUENT exclusive programming bundle. The outcomes demonstrate a gigantic increment in the warmth exchange rate with edge tendency edge setups when contrasted with customary straight cutting edge. The Nusselt number is observed to be in a power-law association with the Reynolds number. Particular connection among laminar and tempestuous condition is anticipated. [4]

K. Sowjanya & S. Suresh (2013), paper shown in an examination of the structure of a circular brake rotor. The circular brake is usually made with a Cast machine, so it is preferred to assess the effect of a small shift from coherence from the expected pressure rotation. Aluminum Metal Matrix Composite materials are selected and tested. Space is considered as a pivot symmetric, dormancy and the effects of obstruction are not significant during the investigation. The Disk brake model was created using Solid demonstrating programming Pro / E (Cero-Parametric 1.0). Ongoing Ongoing Analysis is completed using the ANSYS Workbench. The warm response of Von Misses' basic investigation and extreme pressure was found to be 50.334 M Pa for CI, 211.98 M Pa for AIMMC1, and 566.7 M Pa for AIMMC2, the suspension of the Brake circle is protected by a condition of strength and durability [5]

3. CONCLUSIONS & FUTURE SCOPE

A disc brake is a way to reduce or stop the wheel rotation. Braking is the process of converting a car's kinetic energy into mechanical energy that must be dissipated by temperature. Determination of braking power is the most important factor to consider when designing any braking system. The braking force produced should always be greater than the required braking force. Calculation of the required strength strength helps us determine the boundaries of the disc brake rotor. Modeling and analysis of the disc brake rotor is done to select the best durable material. We found four different materials Grey Cast Iron,

Aluminum Alloy, Titanium Alloy and Carbon Fiber in our study. Analysis is performed on these factors and it concludes that Carbon Fiber shows minimum pressure and aging values in boundary conditions. Carbon Fiber is therefore proposed for future Disc Brake Rotor.

The final design of the machine and the shape and size of their parts allow it to get enough repetition of power to stop the car completely. Consideration of design features to facilitate machine design. This is important to understand the force of action and the force of a collision on a new disc brake device, using an effective disc brake, which can help reduce the risk that can occur on a daily basis.

4. FUTURE SCOPE

In the future this function can be extended by Using different composite materials We can perform thermal CFD analysis on dick brake rotor with different boundary conditions such as liquid pressure, temperature etc. The modular design will be analyzed without considering the effects of thermal expansion. Vibration analysis can be performed. Alternative analysis can be performed using UTM machine and other strength tests

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